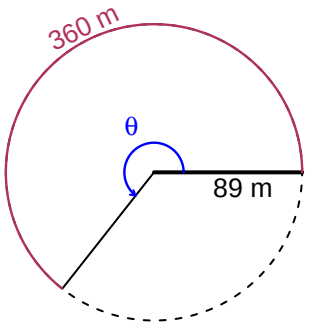
Name: Date:

Trig Final (Solution v43)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 360 meters. The radius is 89 meters. What is the angle measure in radians?

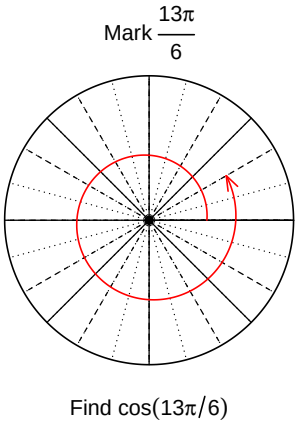


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

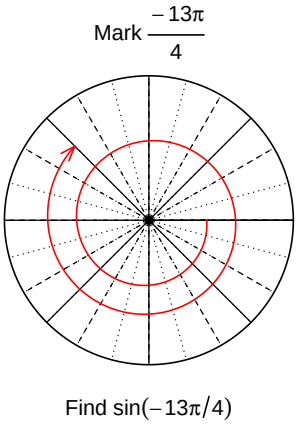
$\theta = 4.045$ radians.

Question 2

Consider angles $\frac{13\pi}{6}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{13\pi}{6}\right)$ and $\sin\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).



Find cos(13π/6)



Find sin(−13π/4)

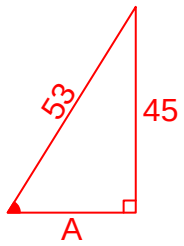
$\cos(13\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-45}{53}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

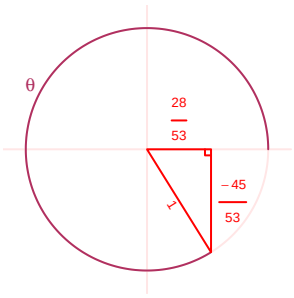
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 45^2 = 53^2$$
$$A = \sqrt{53^2 - 45^2}$$
$$A = 28$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-45}{53}}{\frac{28}{53}} = \frac{-45}{28}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 5.23 Hz, a midline at $y = -7.28$ meters, and an amplitude of 3.15 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.15\cos(2\pi 5.23t) - 7.28$$

or

$$y = -3.15\cos(10.46\pi t) - 7.28$$

or

$$y = -3.15\cos(32.86t) - 7.28$$